

WHEN RESPONSE NULLIFIES

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“Anyone who considers himself in this way will be seized with terror and, discovering that the mass nature has given him supports itself between two abysses of infinity and nothingness, he will tremble in the face of these marvels (...)”

(Blaise Pascal, 1623-1662, *Pensées*)

The physical world is the world of response. From the ebullient subatomic realm to the abysmal substrate where galaxies pirouette, lies response. But what is response?

To begin with, and to develop our argument, we will digress on what response is *not*. Response is not observability. Observability is the act of inferring the internal states of a given system from the knowledge of its external outputs. There are two profound dependencies of observability (to which we shall return later). First, *internal and external notions are arbitrary realms interfaced with synthetic continuity*. Second, *knowledge of external output is the act of standardization of differences*, the register or awareness of change. One is inevitably forced to carry this standardization into the internal state, which is already a forced abstraction, in order to probe what is regarded as the “physical world”.

Yet, “observability works”.

This is the most interesting thing about observability. Because “it works”, human beings became notable practitioners of careful observation, and hence, of prediction and formulation of regular laws, and became “scientists”. In a very pragmatic sense, humans were able to construct an objective vision of nature. One wonders whether the interesting impression that humans lie “between two abysses of infinity and nothingness”, as Pascal so discerningly put it, could be the ultimate origin of the coincidence between the human capacity for confronting theory with observation, to the point of often reaching an admirable agreement between the two. Something like a pure question of relative scale and general internalization of standard rules of change.

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However, as the limits of knowledge stretched back and forth from “the ebullient subatomic realm to the abysmal substrate where galaxies pirouette”, the notion of observability proved to lose a kind of natural contact, and it clashed *itself* with human intuition. Although it was still possible to attain a high degree of agreement between the theory and the experiment, as in quantum electrodynamics, there was a high price to be paid. The price was the search for a necessary revision, started in the last century, and presently still inconclusive, pertaining to ontic “contact”-like notions such as causality, locality, determinism, objective reality, etc., to ontic “presence”-like notions, such as time, space, inertia, energy, matter. The attempt at unification of the fundamental interactions materializes the need for revision of those concepts.

At this point, however, it is important to draw our attention to the question of how far the notion of observability is the adequate probe of what we call the “physical world”, and subsequently, of what is ultimately possible in physics. To that aim, we return to the two profound dependencies of observability, mentioned at the beginning of this essay. We argue that the first point, namely: the fact that *internal and external notions are arbitrary realms interfaced with synthetic continuity*, are ultimately a question of *relative scale* (of extensive nature) and of *abstractive isolationism* (of intensive nature). The second point, that the *knowledge of external output is the act of standardization of differences*, is directly dependable on the construct of the human brain.

Under that argument, observability does not necessarily lead to a one-to-one picture of the “physical world”. There is no *a priori* reason that the physical world should have any particular dependence on the observer’s relative scale, isolationism attributes of arbitrary origin, nor from particular accidental (biological) constructs. Although theories approximately validated from observations may provide excellent agreement (or sufficient agreement for practical purposes), one may pose the question of whether the physical world is more than what is observed (and theorized under those same observational constraints). Indeed, one may argue that what one “cannot observe” is not subject to scientific scrutiny, even though current theories can be perfectly based on internal constructs that are not truthfully “observable” (as gauge invariance, for instance), but to which can be validated from its internal mathematical consistency and overall experimental agreement.

Yet, the question here is not on the validity of the scientific method, which is in fact an extremely robust guideline, which does not appear to need any modification. The question that is here argued is the plausibility that observability is a poor measure of the physical world, *when we search for its ultimate constituents*, due to the facts raised above. Although we recognize that the present argument is not fully developed, let us suppose for a moment the possibility that it is reasonable.

Therefore what we want to develop here is the notion of response, and the possibility that it offers a direct connection to the physical world, wherein observability is just a minor layer. More precisely, we argue is that *the physical world itself is undistinguishable from response*.

In order to define response, let us suppose that the universe decays into its lowest possible energy level. We shall not analyse what our current best understanding of nature, based on general relativity and quantum field theory, would predict for the overall properties of such a decayed universe. Let us regard it, instead, as a model of a minimalistic universe, the *minimum* universe. This irreducible universe is a compact manifestation of the universe at any other possible state (the latter is “derived”, “blossoms” from its lowest energy state). The only channel to obtain whatever knowledge (be it microscopically or macroscopically) of such a universe would be to infinitesimally disturb it. We are not concerned with the fact that it would be necessary a “bit” of energy above the vacuum fluctuations in order to realize such a disturbance. What concerns us here is the fact that *such a disturbance is the channel through which the minimum universe evokes a response.*

Responsiveness is the leading fact that makes the universe be the way it is. The physical world is *responsive*, interactive, a process-based world. Response is *itself a primary process* at the genesis of the universe, the very basic property innate to nature in order to define it to whatever form it manifests, at whatever arbitrary level of complexity dictated by its energy or entropic level.

Under a deeper consideration, that fact is not a trivial or expected one. There is no *a priori* reason to suppose that the universe should be responsive. Universes can be *whatever* (and we are quite limited creatures to even imagine the possibilities), but it happens that ours appears to work solely under responsiveness. Everything else is built upon responsiveness. This is the ultimate nature of the universe.

When we observe, we *act* upon nature, and nature reacts. Observability is a layer on the inherently responsive nature of the universe, and it is dependent on the two factors previously stated. Responsiveness is independent of those and genuine to what the physical world really is. Hence, it is argued that in order that human beings reach such a level of understanding, be it of intellectual or technological nature, it is absolutely necessary to disentangle from simple observability towards responsiveness. But, according to our arguments, this can only be attained by a change of perspective that it is currently impossible for the human being to realize, again, be it intellectually or technologically. As Pascal notes, we are suspended between infinity and nothingness, but this state of affairs is deeper than we realize, because it is not only a question of scale. It is of an intensive nature, as well as of a (chemically-related, biological) contingency.

So the answer to what is ultimately possible in physics is its own ultimate response. The next step is beyond comprehension. The whole universe would cease to be knowledgeable, ultimately, when response nullifies.